Acta Parasitologica Globalis 6 (2): 129-135, 2015
ISSN 2079-2018

DOI: 10.5829/idosi.apg.2015.6.2.95108

Prevalence and Identification of Major Ixodid Tick Genera of Cattle in Dangila District, Awi Zone, North West Ethiopia

Bemrew Admassu, Habitamu Yeneneh, Anmaw Shite, Belete Haile and Saddam Mohammed

Department of Veterinary Pharmacy and Biomedical Sciences,
Faculty of Veterinary Medicine, University of Gondar, Gondar, Ethiopia

Abstract: A cross- sectional study was conducted in Dangila District, Awi zone, from November, 2014 to April, 2015 to estimate the prevalence of major ixodid ticks on cattle and to identify the prevalent ticks to the genera level. Study animals were selected randomly. Out of the total of 384 cattle examined, 216(56.2%) were found to be infested by one or more ticks. About 864 adult ticks were collected from the animal body parts, preserved with70% alcohol and were identified to genera level by using stereo-microscope. From the total ticks collected, four genera's namely; Amblyomma, Boophilus, Rhipicephalus and Hyalomma were identified and account for 37.5, 25.0, 23.1 and 14.4%, respectively. From different variables (sex, age, breed and body condition), only body condition was statistically significant with tick infestation ($p< 0.05$). The prevalence of tick infestation was was found highest in poor body condition animals (62.9%) while in medium and good body condition, it was found (59.4%) and (41.2%), respectively. In logistic regression analysis only body condition has shown statistical significance. The odd of the infestation in poor body condition was 2.4 times higher than in good body condition animals. It has also been evident that the favorable predilection sites of Amblyomma tick were ventral body parts and perineum region. Boophilus preferred dewlap, udder/scrotum, belly, leg, head and perineum. Rhipicephalus had a strong affinity for perineum, dewlap, udder/scrotum, tail tips and ears. For Hyalomma the perineum region, udder/scrotum and under tail were its hiding sites. From this study we can make a conclusion that the prevalent ticks could also be responsible for transmission of tick borne diseases in addition to their physical damage to the skin. Therefore, further studies should be carried out on tick burden and tick borne diseases.

Key words: Cattle · Dangila District · Prevalence · Tick

INTRODUCTION

Ethiopia represents various climatic zones and livestock production systems in tropical Africa [1]. It has the largest number of livestock in Africa, approximately 53.99 million cattle, 25.5 million sheep and 24.06 million goats, 1.91 million horses, 6.75 million donkeys, 0.35 million mules, 0.92 million camels, 50.38 million poultry and 5.21 million bee hives [2]. Among livestock, cattle play a significant role in the socio-economic aspects of the life of the people of Ethiopia. In addition to the products like meat and milk, cattle provide draught power for cultivation of the agricultural lands of many peasants. Skins and hides are also important components of the livestock sector in generating foreign export earnings [3]. Even though they are important components of the Ethiopian farming system, their contribution to food production, rural income and export earnings are far below the expected potential. This is because cattle production in Ethiopia is constrained by the compound effects of animal diseases, poor feeding and poor managements [4].

Now a day, parasitism represents a major obstacle to development and utilization of animal resource. In Ethiopia, ectoparasites in ruminant causes serious economic loss to small holder farmers, the tanning industry and the country as a whole through mortality of animals, decreased production, down grading and rejection of skin and hide [5]. As a result of their activity

Corresponding Author: Bemrew Admassu, Department of Veterinary Pharmacy and Biomedical Sciences, Faculty of Veterinary Medicine, University of Gondar, Gondar, Ethiopia, P.O. Box 196.

ectoparasites may have a variety of direct and indirect effects on their hosts. Ectoparasites commonly tick, mite and lice affect the condition of host species by the inflammation and the infection they inflict on the skin [6] and by their effect on the physiology of the animals as well as through transmission of different diseases [7, 8]. Infestations by ectoparasites significantly affect the quality of hide thereby affecting the economy of Ethiopian farmer's as well as international market [9].

Ticks are the most important ecto-parasites of livestock in tropical and sub-tropical areas and are responsible for severe economic losses in livestock. The major losses, however, caused by ticks are due to their ability to transmit protozoan, rickettsial and viral diseases of livestock, which are of great economic importance world-wide. Tick-borne protozoan diseases (example: Theileriosis and Babesiosis) and rickettsial diseases (example: Anaplasmosis and cowdriosis) and tick-associated dermatophilosis are major health and management problems of livestock in many developing countries. The economically most important ixodid ticks of livestock in tropical regions belong to the genera of Hyalomma, Boophilus, Rhipicephalus and Amblyomman [10].

A complex of problems related to ticks and tick-borne diseases of cattle created a demand for methods to control ticks and reduce losses of cattle production and productivity [11]. Control of tick infestations and the transmission of tick-borne diseases remain a challenge for the cattle industry in tropical and subtropical areas of the world. Tick control is a priority for many countries in tropical and subtropical regions [10, 11].

In Ethiopia, there are 47 species of ticks found on livestock and most of them have importance as vectors for disease causing agents and also have damaging effect on skin and hide production [12]. Ticks, besides being important vectors for diseases like theilerosis, anaplasmosis, babesiosis and cowdriosis (heart water) in domestic animals; they also cause nonspecific symptoms like anemia, dermatosis, toxicosis and paralysis [1]. Even though, tick infestation in cattle was prevalent in Dangila District, the distribution and identification of ticks were not well studied. Hence, the objectives of the study were:

- To estimate the prevalence of major ixodid ticks on cattle.
- To identify the prevalent ticks to the genera level.

MATERIALS AND METHODS

Study Area: The study was conducted in Dangila District at DangilaVeterinary Clinic. Dangila is found in Awi administrative zone, Amhara national regional state and located 78 kms away from Bahir Dar and 485kms from Addis Ababa, Ethiopia. Geographically, the area lies between 11.3° latitude and 36.8° longitude with an elevation of 2137 meters above sea level. Dangila is bordered on the South by Faggeta Lekoma, on the South West by Guangua, on the North West by the Jawi and on the North East by the Mirab Gojjam Zone. Towns in Dangila district include Addis_Alem, Dangila and Dek. Part of the Dangila was separated to create Jawi woreda. The general climate is moist subtropical (*woina Dega)* characterized by moderate temperature and sufficient rainfall. Based on records at Dangla town, the mean annual temperature is about 17°C and the annual rain fall is 1578mm. Based on the 2007 national census conducted by the Central Statistical Agency of Ethiopia (CSA)[2], this woreda has a total population of 158,688, of whom 80,235 are men and 78,453 women; 27,001 or 17.02% are urban inhabitants. According to the Dangila Woreda Rural Development and Agricultural Planning Office [13], the district has a livestock populations of cattle, 152032(local) and 4017 (cross), sheep (58243), goats (19659), mules (423), horses (564), donkeys (1050), poultry (87946) and bee colonies are kept in three categories of bee hives: traditional (1050), transitional (135) and modern (868) bee hives.

Study Design and Methodology: A cross-sectional study was conducted from November 2014 to April 2015 in Dangila district. Active data was generated from randomly selected cattle. In this study, a simple random sampling technique was employed. Cattle which were included in the sample were examined carefully for the presence or absence of ticks on their body parts. Then the collected ticks were carefully examined to group them in to their genera using the guide indicated in Walker *et al*. [14].

Study Population: The study subjects were cattle of different breed, age and sex brought to Dangila veterinary clinic. A total of 384 animals (local and cross breed) were randomly selected and examined, which are managed under extensive system. The age, sex, breeds and body condition scores of each animal was also recorded.

Sample Size Determination: The total number of cattle required for the study was calculated based on the formula given by Thrusfield [15]. By rule of thumb where there is no documented information about for the prevalence of tick infestation in the study area, it is possible to take 50% prevalence as minimum expected prevalence. In this study the sample size was calculated using 50% prevalence with 5% desired level of precision and 95% of confidence interval.

$$n = \frac{1.96^2 Pexp(1 - Pexp)}{d^2}$$

where:
n = sample size;
Pexp = minimum expected prevalence = 50%
d = desired accuracy level at 95% interval.
Z = Corresponding critical value for 95% CI =1.96
As a result, 384 study populations were selected.

Samples and Sampling Methods: Ticks were collected manually from their attachment site in the host animals which were brought to Dangila veterinary clinic by using sampling bottle containing 70% alcohol. Then samples were transported to Bahir Dar regional laboratory for the identification of the major ixodid ticks to the genera level. According to Aiello and Mays [16], the study populations were categorized into three age groups these are <1 year, 1-3years and >3years), breed (local and cross) and Ferguson [17] divide the body condition score as (poor, medium and good).

Tick collection and identification-After the selected animals were restrained properly, all visible adult ticks were collected from their half body part manually by using forceps. Ticks with their intact mouthpart were collected carefully for proper identification and they were preserved in 70% alcohol as outlined in Jana and Ghosh [18]. Then it was labeled with the date of collection, age and sex of the hosts. They were identified by using a stereomicroscope according to standard identification keys given by Walker *et al.* [14]. During processing, the tick sample in each sampling bottle were transferred to a petridish, unwanted foreign materials such as hair, dry skin and other dirt were removed. The ticks then spread on filter paper to absorb excess preservative fluid. Ticks with dirty scutum were rubbed on filter paper to make them clean and easy for identification [14]. The count of ticks from half body zone of each animal was doubled to give the total number of ticks per animal, assuming equal number of infesting ticks on both sides of an animal.

Data Analysis and Presentation: The data was checked, coded and entered in to Microsoft excel work sheet and was analyzed using SPSS software version 16. Descriptive statistics like percentage was used to express prevalence while chi-square (÷2) test, binary and multivariate logistic regression were used to compare the association of tick infestation rate with sex, breeds, age groups as well as body condition scores. In all the cases, 95% confidence level and 0.05 absolute precision errors were considered. A p-value ≤ 0.05 will be considered statistically significant.

RESULTS

Prevalence and Distribution of Ticks: The prevalence of ticks from the total examined cattle was found 56.2% (216/384). In this study a total of 384 animals were examined. Among these 341 (88.8%) were local and 43 (11.2%) were cross breeds. A total of 864 adult Ixodidae ticks were collected from half body region of infested cattle. In general, four Ixodidae tick genera were identified from the study area. From identified generas; *Ambylomma* (37.5%) was the most abundant and widely distributed genus followed by genus *Boophilus*(25.0%) and genus *Rhipicephallus*(23.1%). However, *Hyalomma* (14.4%) was found to be the least abundant genera (Table 1).

The prevalence of ticks in less than one year, one to three years and greater than three years was found to be, 38.6, 57.9 and 58.6% respectively. Based on their sex variation it was 53.5% in males and 60.1% in female animals. Variation in breed also occurs, in that local breeds were affected less as compared with cross breeds; 55.7% and 61.0% respectively. Poor body conditioned animals were found severely affected with ticks than medium and good body condition animals as seen in (Table 2).

Body condition was statistically significant associated with tick infestation at which the odd of engaging the disease in poor body condition were 2.4 times higher than cattle that have good body condition. In binary and multivariate logistic regression analysis of different variables (age, sex and breed) were not statistically significant associated with tick infestation in this study.

Table 1: Prevalence of tick genera of cattle in Dangila District

Genus	Percentage of total ticks
Ambylomma	37.5% (324/864)
Boophilus	25.0% (216/864)
Rhipicephallus	23.1% (200/864)
Hyalomma	14.4% (124/864)

Table 2: Prevalence of ticks with relation to different risk factors in both cross and local cattle breeds in Dangila District.

Risk Factors	Animals Examined	Animals Positive	Prevalence (%)	P-value	x^2
Age					
Less than one year	38	14	36.8		
One to three years	126	73	57.9	0.15	3.76
Greater than three years	220	129	58.6		
Sex					
Male	226	121	53.5	0.20	1.63
Female	158	95	60.1		
Body condition score					
Poor	159	100	62.9		
Medium	128	76	59.4	0.02	12.24
Good	97	40	41.2		
Breed					
Local	343	191	55.7	0.51	0.41
Cross	41	25	61.0		

Table 3: Logistic regression analysis of tick infestation with different risk factors (variables): both binary and multiple logistic regressions

	Tick infestation		OR(at 95% CI)		
Variables	yes	no	COR	AOR	P-value
Body conditions					
Good	40	57	1.0	1.00	P=0.001*
Medium	76	52	2.1(1.218-3.561)	2.3(1.309-3.9029)	
Poor	100	59	2.4(1.441-4.043)	2.4(1.389-3929)	
Age					
Below 1 year	14	24	1.00	1.00	P>0.05
1-3 year	73	53	1.9 (0.898-3.083)	0.789(0.388-1.593)	
Above 3years	129	91	1.3(0.657-2.609)	1.4(0.893-2.248)	
Sex					
Male	121	95	1.0	1.00	P>0.05
Female	105	63	1.3(0.867-1.976)	0.8(0.540-1.278)	
Breed					
Local	191	152	1.0	1.00	P>0.05
Cross	25	16	1.2(0.641-2.412)	0.7(0.359-1.438)	

**indicates the statistically significant variable both in binary and multivariate logistic regression*

Key*: OR- odd ratio, COR-crude odd ratio, AOR- adjusted odd ratio*

Table 4: Proportion and host body site distribution of ticks

Species of ticks	Number of ticks	Predilection sites
Amblyomma	324	Scrotum, udder, brisket, belly, dewlap, vulva, perineum
Boophilus	216	Dewlap, ears, scrotum, brisket, udder, flank, legs
Hyalomma	124	Udder, scrotum, tail, anus
Rhipicephalus	200	Ear, dewlap, brisket, udder, tail, vulva, anus

Ticks body part distribution**:** The study was also investigated the types of ticks genera and their spatial distribution on the body of the animal. Ticks were found widely distributed in different parts of the hosts' body such as ear, neck, tail, mammary gland, brisket, belly, udder/scrotum and perinial region. Of these sites udder/scrotum, dewlap, anal area and tail regions were most infested parts of the animal's body and face and neck was the least affected (Table 4 below).

DISCUSSIONS

Different tick genera's are widely distributed in Ethiopia and a number of researchers reported the distribution and abundance of ticks in different parts of the country [1]. In the present study, the total tick infestation prevalence was found 56.2%. This finding is greater than the reports of Kassa and Yalew [19] with a prevalence of 33.21% in Haramaya district and Tesfahewet and Simeon [20] a prevalence of 16.0% in Benchi Maji Zone of the Southern Nations and nationalities of Ethiopia. In contrast to this Nigatu and Teshome [21] were reported a higher prevalence of ticks (89.4%) from Western Amhara Region. The lower result of the present study may due to the application acaricides and different methods of prevention and control strategies.

Amblyomma, Boophilus, Rhipicephalus and Hyalomma were the four important genera of ticks encountered during the study period, with a total prevalence of 37.5 25.0, 23.1 and 14.4% respectively. The genus Boophilus tick was greater in prevalence in this study (25%) than Tiki and Addis's [5] reported (18.13%) in and around Holeta and Tamiru and Abebaw's [3] in Asella (15.4%). But it was reported in a greater prevalence rate (45%) than the current study (25%) in Bossena and Abdu's [22] study in and around Assosa. Amblyomma tick infestation was indicated higher in studies of Tiki and Addis [5], Kassa and Yalew [19], Tamiru and Abebaw [3] and Bossena and Abdu [22] with a prevalence of 50.5, 47.16, 60.1 and 45% respectively. The genus Hayalomma tick (14.4%) prevalence in this study was much greater than Tiki and Addis's [5] reported (1.85%) in and around Holeta. In contrast to this higher result of Hyalomma tick was recorded in Gedilu *et al.* [23] study in Bahir Dar. A greater result of Rhipicephallus tick was recorded in Gedilu *et al*. [23] study in Bahir Dar (48.1%) than the current study (23.1%). But, studies by Nigatu and Teshome [21] indicated lesser prevalence of 6.6% from western Amhara Region.

Risk factors (sex, age, breed and body condition scores) were also involved in the variations of the prevalence of ticks in the study area. The prevalence of ticks was 62.9, 59.4 and 41.2% in poor, medium and good body condition scores. It appears with statistical significance association where the p value is less than 0.05 (P=0.02) and chi-square 12.24. Similar finding was indicated in Bossena and Abdu [22]. And also it has been lined with the study made by Gedilu *et al* ([23]. This result disagree with the statement given by Kassa and Yalew [19] and Tesfaheywet and Simeon [20] because there existed no statistical significant difference (P>0.05) in the prevalence of ticks among the body condition score categories of cattle breeds. This could be related to the management system where animals are allowed to graze together in communal fields in the mixed farming system of the study area. And also in binary and multivariate logistic regression analysis body condition was statistically highly associated(P=0.001) with tick infestations in which the odds of engaging with tick infestation in poor body condition cattle was 2.4 times higher than those animals having good body conditions. The higher prevalence of ticks in the poor body condition scores than other counter parts could be due to the less resistance of weak animals to ticks infestation as a result of low immunity.

The difference in prevalence was found statistically insignificant (P>0.05) between sex of cattle. Male animals were found less affected than females (in male 53.5% and in female it was 60.1%) with no statistical significance (P- value>0.05 and x^2 = 1.63). This result is in line with the other author in Benchi Maji by Tesfaheywet and Simeon [20] but it disagreed with the previous works in Assosa by Bossena and Abdu [22] that the difference in prevalence was found statistically significant between sex groups. This result is also concurred with the results of Kassa and Yalew [19] where the p-values were greater than 0.05. This might be due to equal opportunities of oxen and cows to tick infestation in their production as well as in their management condition.

Age also matters in the prevalence of ticks in cattle in the study area. In those less than one year it was 36.8% while in one year to three year and greater than three years were 57.9 and 58.6% respectively. But there is no statistical significance difference (P> 0.05) between the age groups. Similar findings were reported by Kassa and Yalew [19] and Tesfahewet and Simeon [20]. However, Bossena and Abdu [22] reported that exist statistical significance difference in the age group. Also it contradicts the study made by Gedilu *et al* [23] the difference in prevalence among the age groups were statistically significant (P<0.05, x^2 =93.040) and he stated that the higher prevalence were recorded in animals >3years (85.1%). In general, the prevalence of ticks in all the researchers indicated that very young animals are affected less than adult animals. This could be due to the less exposure to field grazing with other animals in the field and adults are exposed due to the communal grazing habit.

Local breeds (55.7%) were affected less than the cross breeds (61.0%) but with no statistical significance differences (p>0.05). This result was disagreed with the findings of Kassa and Yalew [19] who reported the prevalence of tick infestation was significantly higher (P<0.05) in local breed cattle (58.18%) than cross breed ones (10.55%) and Tamiru and Abebaw [3]; the burden of ticks on cattle had statistically significant difference (*P*<0.05) between local (mean=13.1 tick/head) and crossbreed (mean=21.4 tick/head) breed cattle. However, this finding agrees with the findings of Tamiru and Abebaw [3] in that the prevalence of ticks was higher in the cross breeds than local breeds. This might be due to cross breed animals are genetically less resistance for any disease conditions than local breed animals. And also the management system plays a great role for the variation of tick infestation in different breed of animals.

CONCLUSIONS

The important and abundant tick generas investigated in this research ranking first and second were *Amblyomma* and Boophilus followed by Rhipicephalus and lastly Hyalomma. The study indicated that there was high burden of ticks in the study area. However, the attention given to controlling the infestation had not been sufficient. The control methods necessary for tick and TBDs were selection of tick resistance cattle, acaricides treatment, appropriate livestock management, evaluation and incorporation of traditional practices or remedies that appear to be of value. Generally, the distribution of ticks are not fixed but are determined by a complex interaction of factors such as climate, host density, host susceptibility, grazing habits and pasture-herd management. Therefore, effective tick control program should be formulated and implemented based on the distribution pattern of ticks and factors responsible for their distribution. Based on of the above conclusions the following recommendations are forwarded:

- Further studies on factors affecting tick burden and tick control strategies as well as on tick borne diseases should be conducted.
- Community should be well informed about the proper control and care of their livestock from ecto-parasite in general and about tick in particular
- Appropriate pasture management in communal grazing area is important.
- Tick control program (Application of acaricides) should be continued with an increasing frequency of application in wet months and acaricide resistance tick species should be detected since this is economically important because limited types of acaricide were used in the area.

REFERENCES

1. Solomon, G., M. Nigist and B. Kassa, 2001. Seasonal variation of ticks on calves at Sebeta in western Shewa Zone. Ethiopian Veterinary Journal, 7(1&2): 17-30.
2. Central Statistics Authority (CSA), 2012/13. Ethiopia agricultural Statistical report on livestock and livestock characterstics.
3. Tamiru, T. and G. Abebaw, 2010. Prevalence of ticks on local and crossbreed cattle in and around Asella town, south east Ethiopia. Ethiopian Veterinary Journal, 14(2): 79-89.
4. Getachew, T., 1995. Parasites of small Ruminants. In: Gray, G. D. and Uilenberg, G, 1998. Eds. Parasitological Research in Africa.
5. Tiki, B. and M. Addis, 2011. Distribution of Ixodid Ticks on Cattle in and Around Holeta Town, Ethiopia. Global Veterinary, 7(6): 527-531.
6. Taylor, M.A., R.L. Coop and R.L. Wall, 2007. *Veterinary Parasitology*. 3rd ed. Singapore: Blackwell publishing, Hongkong.
7. Wall, R. and D. Shearer, 2001. Veterinary ectoparasites: Biology, Pathology and Control. 2nded. Blackwell science.
8. Bekele, J., M. Tarikua and R. Abebe, 2011. External parasite infestation in small ruminants in Wolmera district, Oromia region, Central Ethiopia. J. Anim. Vet. Adv., 10: 518-523.
9. Bekele, T., 2002. Study on seasonal dynamics of tick of Ogaden cattle and individual variation in resistance to ticks in Ethiopia. Ethiopian Journal of Veterinary Medicine, 49: 285-288.
10. Frans, J., 2000. Final Report, Integrated Control of Ticks and Tick-Born Diseases (ICTTD). (Available at: http://www.uu.nl/tropical.ticks) [Accessed on 5 May 2015].
11. George, J.E., J.M. Poundand and R.B. Davey, 2004. Chemical control of ticks on cattle and the resistance of These Parasites to Acaricides, 129(7): 353-366.
12. Bayu, K., 2005. *Standard veterinary laboratory diagnostic manual.* Vol. III., Addis Ababa: MOA.

13. DangilaWoreda Rural Development and Agricultural Planning Office (DWRDAPO), 2014.
14. Walker, A.A., A. Bouatour, J.L. Camicas, A.A. Estadapena, I.G. Harok, A.A. Hatif, R.G. Pegram and P.M. Preton, 2003. Ticks of domestic animals in Africa: A guide to identification species. The University of Edinburgh, UK.
15. Thrusfield, M., 2005. *Veterinary epidemiology*. 3rd ed. Blackwell publishing, London.
16. Aiello, S.E. and A. Mays, 1998. The merck veterinary manual. 8thed. Merck and coted.Inc: white house, NJ.USA.
17. Ferguson, J.D., 2011. Review of body condition scoring of dairy herd. Available at: http:// www.txanc.org/ wp-content/uploads/2011/.../Body-Condition-Scoring.pdf [accessed on 24 November 2014].
18. Jana, D. and N. Ghosh, 2011. *Essentials of Veterinary Practice*. 1sted. Daya publishing house.
19. Kassa, S.A. and A. Yalew, 2012. Identification of *Ixodide* ticks of cattle in and around Hararamaya district, Eastern Ethiopia. Scientific Journal of Crop Science, 1(1): 32-38.
20. Tesfahewet, Z.S. and H.O. Simeon, 2013. Prevalence of ectoparasite infestations of cattle in Bench Maji zone, southwest Ethiopia. Veterinary World, 6(6): 291-294.
21. Nigatu, K. and F. Teshome, 2012. Population dynamics of cattle ectoparasite in western Amhara National Regional State Ethiopia. Journal of Veterinary Medicine and Animal Health, 4: 22-26.
22. Bossena, F. and M. Abdu, 2012. Survey on the Distribution of Tick Species in and Around AssosaTown, Ethiopia. Research Journal of Veterinary Science, 5: 32-41.
23. Gedilu, M., A. Mohamed and Y. Kechero, 2014. Determination of the Prevalence of Ixodid Ticks of Cattle Breeds, Their Predilection Sites of Variation and Tick Burden Between Different Risk Factors in Bahir Dar, Ethiopia. Jimma University College of Agriculture and Veterinary Medicine, Jimma, Ethiopia. Global Veterinaria, 13(4): 520-529.